UNH Soluble Acidic Gases and Aerosols (SAGA) contributions to INTEX Phase B

UNH SAGA will be part of the DC-8 measurement team during INTEX B. We will use our established techniques to collect soluble acids and fine aerosol (mist chamber samplers) at relatively high frequency. These samples will be analyzed in near-real-time by on board ion chromatography. In addition we will collect bulk aerosol onto filters. These samples will be analyzed back in the laboratory at UNH for soluble ions and the radionuclide tracers ^{7}Be and ^{210}Pb.

The mist chamber sample collection interval will be shorter than 2 minutes throughout all DC-8 flights during the campaign. During INTEX A we maintained a 1.75 minute resolution and expect to maintain or improve this performance for INTEX B. At this sampling rate detection limits are approximately 5 pptv for HNO_3 and fine aerosol $SO_4^{=}$.

Bulk aerosol filters will be exposed for no longer than 10 minutes at flight levels below 10,000 feet and will not exceed 20 minutes at higher altitudes. Detection limits are dependent on the volume of air sampled, but are primarily controlled by variability in the amount of analyte on blank filters (which can change between lots from the manufacturer). We expect to achieve detection limits near or below 5 pptv for NO_3^{-}, $PO_4^{=}$, $SO_4^{=}$, $C_2O_4^{=}$, NH_4^{+} and Mg^{2+}, and better than 20 pptv for Cl^{-}, Na^{+}, K^{+} and Ca^{2+}.

In addition to supporting the analysis, interpretation and publication of the data streams from the SAGA instrumentation package, our project will support Dr. Karen Bartlett and her collaboration with the Sachse and Blake groups focusing on CH_4.

Our core measurements will contribute directly to all of the INTEX B science objectives. The combination of HNO_3, aerosol-associated ions (sources at the ground surface and readily scavenged) and ^{210}Pb (whose inert precursor is emitted from soils) has proven particularly useful to investigate convective transport processes and the subsequent aging of polluted boundary layer air lifted into the free troposphere. Similarly, combined measurements of HNO_3 and ^{7}Be allow assessment of the stratospheric influence on tropospheric composition. Methane, in combination with shorter-lived species such as C_2H_2 and C_3H_8, is a useful tracer of polluted, continental air. Differences in characteristic trace gas ratios between the variety of natural and anthropogenic CH_4 sources also permit evaluation of the human impact on the atmospheric levels of this important radiative and chemical species.

SAGA measurements and subsequent analyses will address the following specific objectives relevant to the INTEX B science plan:

1. We will conduct measurements of HNO_3, fine aerosol $SO_4^{=}$, the water soluble composition of bulk aerosol, and the natural radionuclide tracers ^{7}Be and ^{210}Pb over North America and the eastern North Pacific from the DC-8. Interrelationships between the ionic species and the radionuclide tracers will reveal the contributions strat/trop exchange and lofting of (polluted or clean)

continental boundary layer air make to the composition of free tropospheric air masses in the INTEX B study areas.

2. Relationships between soluble and insoluble species in the data sets from INTEX B as a function of altitude over north American source regions will improve understanding of the relative importance of wet and dry convection in the venting of the polluted boundary layer [e.g., *Dibb et al*., 1996, 1997, 2003].
3. The fate of the ionic species as they evolve and age during long range transport across the Pacific Ocean will be examined, particularly the interactions between acidic gases and continental aerosols [e.g., *Jordan et al.,* 2003]. It is hoped that Asian partners will characterize plumes leaving the Asian continent during the INTEX B study period, but if not we will be able to make qualitative comparisons to our previous measurements over the western North Pacific during PEM West A and B and TRACE P [*Dibb et al*., 1996, 1997, 2003; *Jordan et al.,* 2003].
4. In addition to our measurements of acidic gases and aerosols, we will work cooperatively with researchers from NASA Langley Research Center (Mr. Glen Sachse) and those from the University of California, Irvine (Dr. Don Blake and co-workers) to analyze and synthesize CH_4 and NMHC data. Methane is a key species for understanding the global carbon cycle and is a high priority compound for INTEX and AURA validation.
5. We will provide correlative spatial and vertical distributions of HNO_3 which have been identified as a priority data set needed to validate the TES, OMI and HIRDLS sensors on the recently launched AURA satellite platform.
6. SAGA data sets, with the rest of the measurements made from the DC-8, will challenge, verify and improve the predictions from regional and global chemical transport models by providing detailed distributions of key tropospheric constituents for comparison to the predicted fields calculated by such models in both forecast and *aposteriori* modes.

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